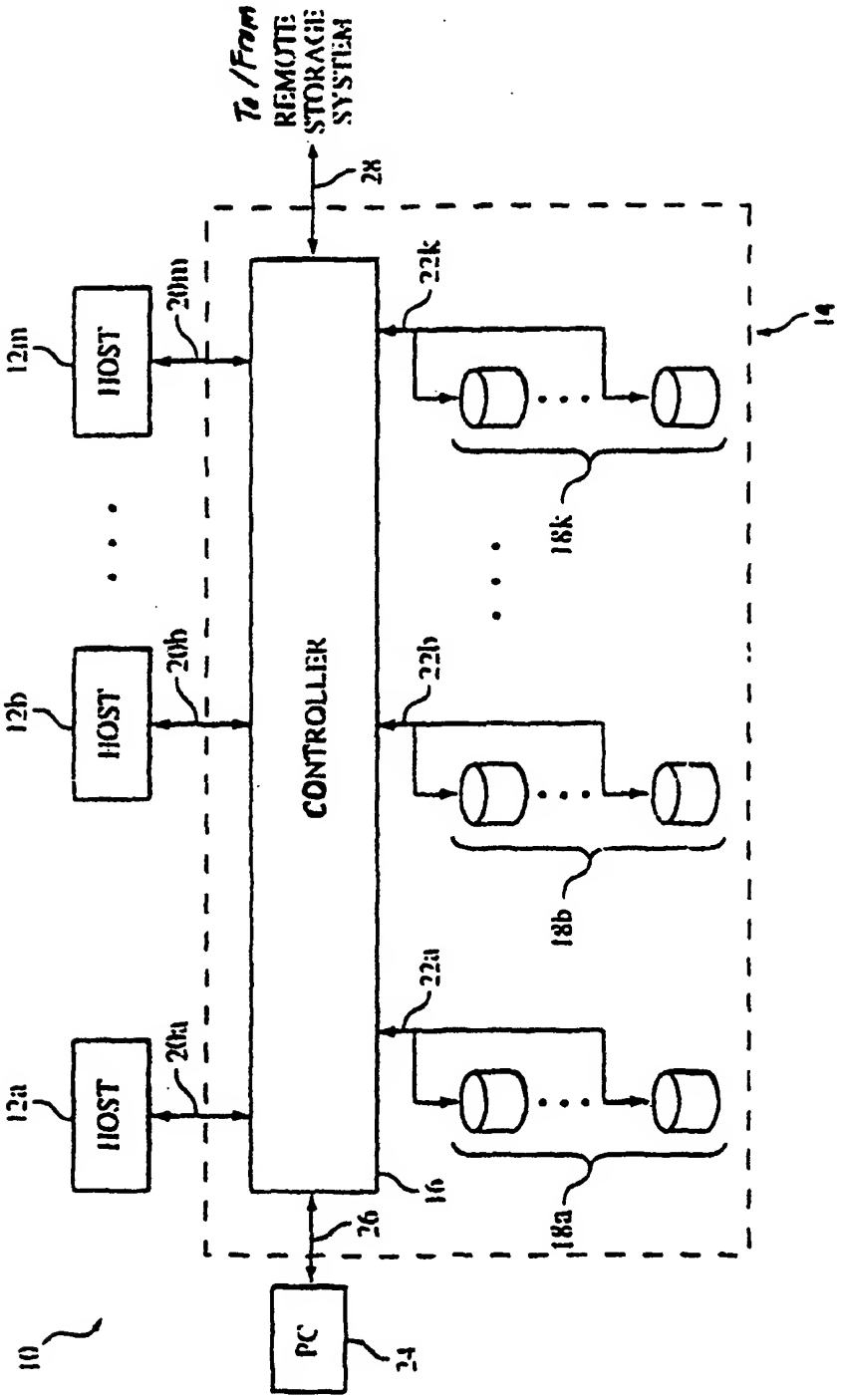
To/From
REMOTE
STORAGE
SYSTEM
28
HOST
12m
20m
22k
14
18k
12b
20b
22b
18b
12a
20a
22a
18a
CONTROLLER
16
26
PC
24
10

FIG. 1

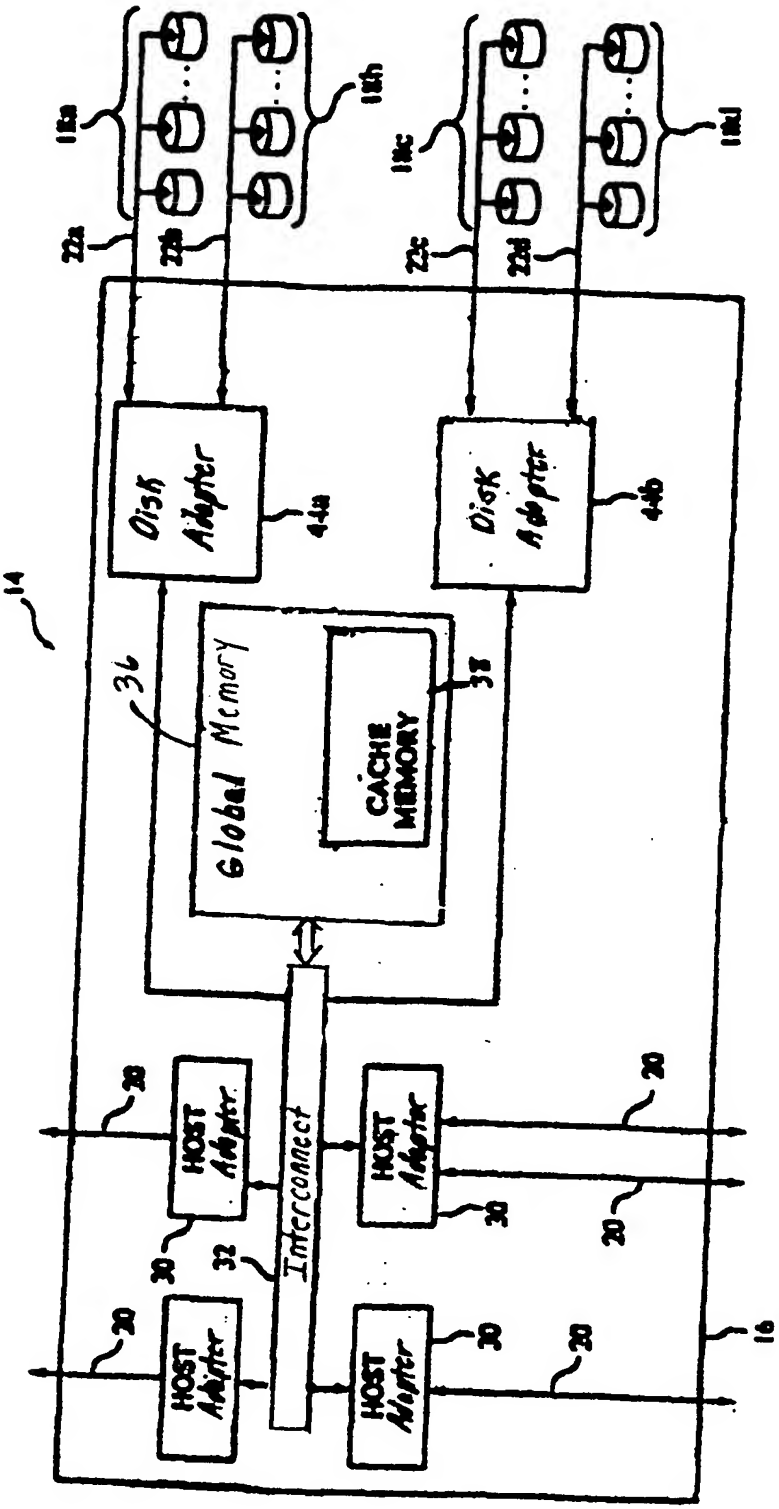
Disk Adapter
Disk Adapter
Global Memory
CACHE MEMORY
Interconnect
HOST Adapter
HOST Adapter
HOST Adapter
HOST Adapter

FIG. 2

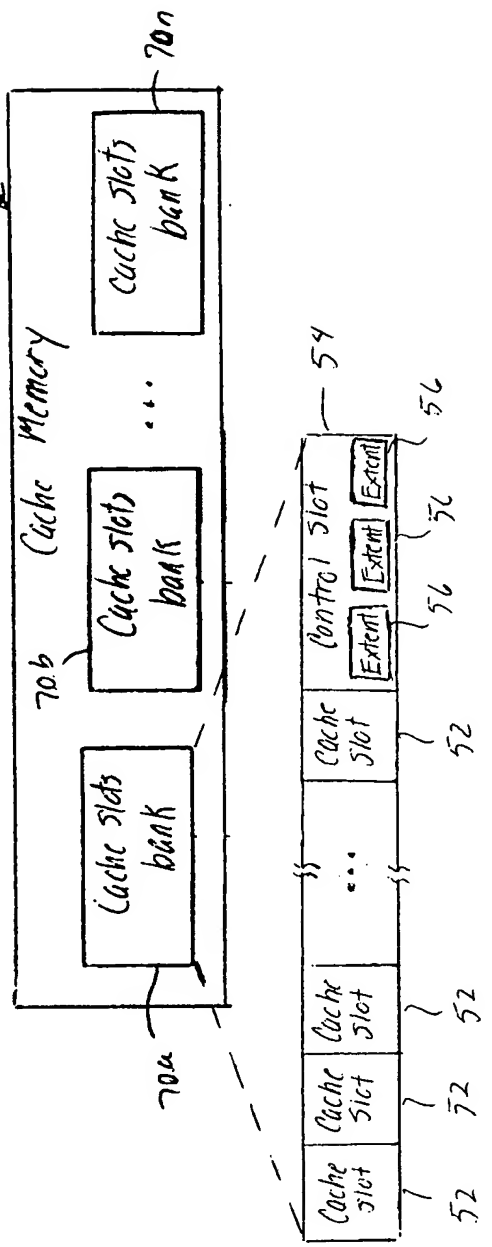
38
Cache Memory
70a
70b
70n
Cache slots bank
Cache slots bank
Cache slots bank
Cache slot
Cache slot
Cache slot
Cache slot
Control slot
Extent
Extent
Extent
52
52
52
52
54
56

FIG. 3A

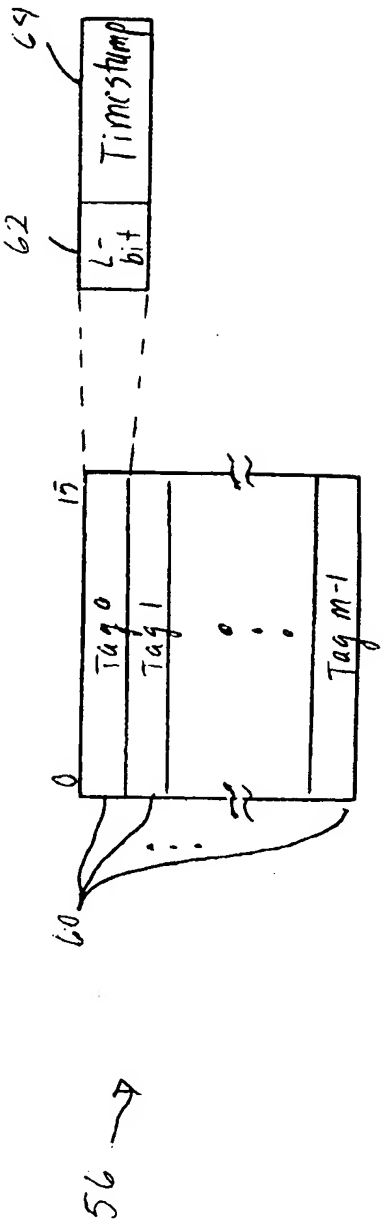
64
62
L-bit
Timestamp
15
0
Tag 0
Tag 1
Tag m-1
60
56

FIG. 3B

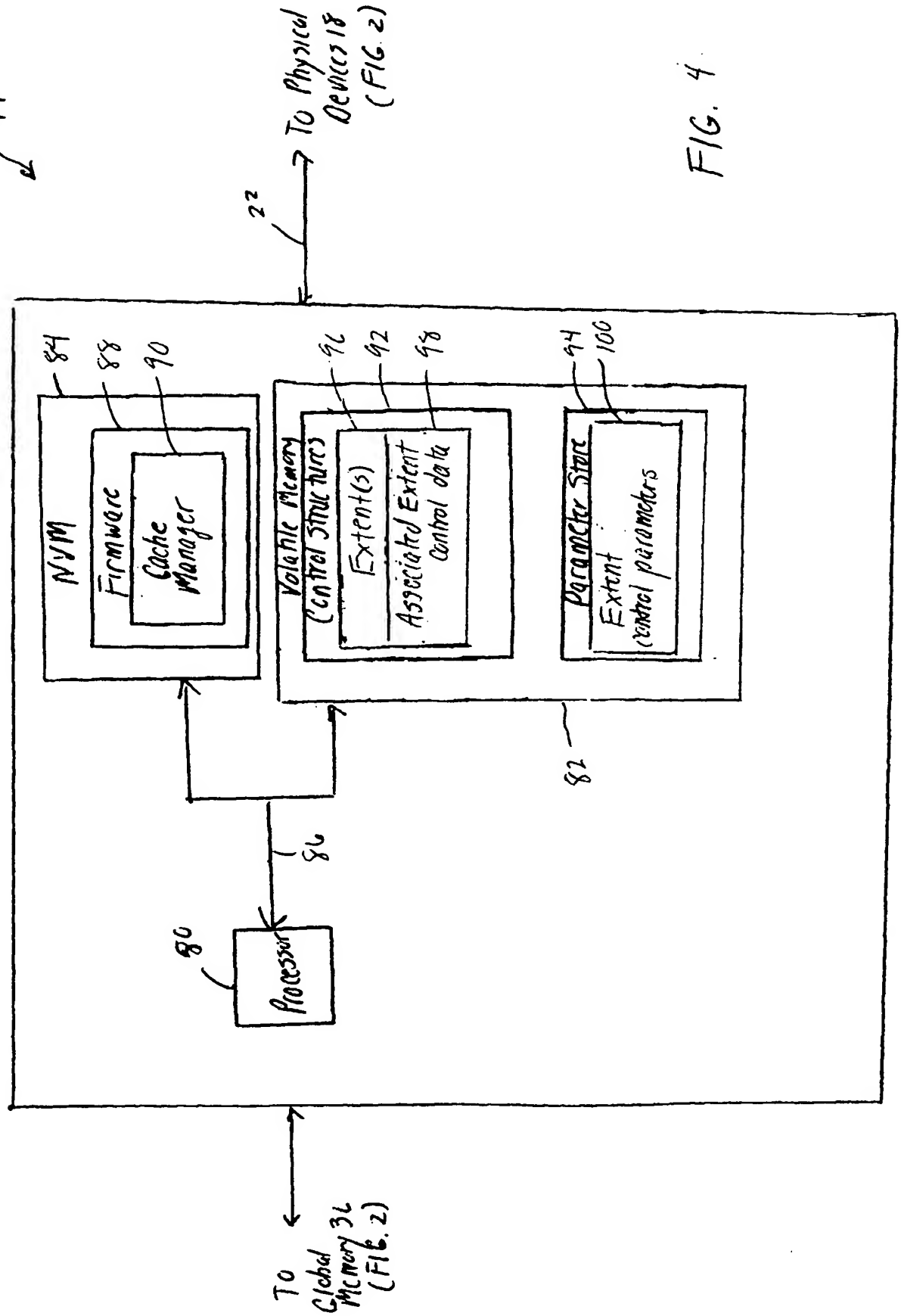
44
To Physical Devices 18 (FIG. 2)
22
NVM
Firmware
Cache Manager
84
88
90
Volatile Memory
Control Structures
Extent(s)
Associated Extent control data
96
92
98
Parameter Store
Extent control parameters
94
100
82
86
Processor
80
To Global Memory 36 (FIG. 2)

FIG. 4

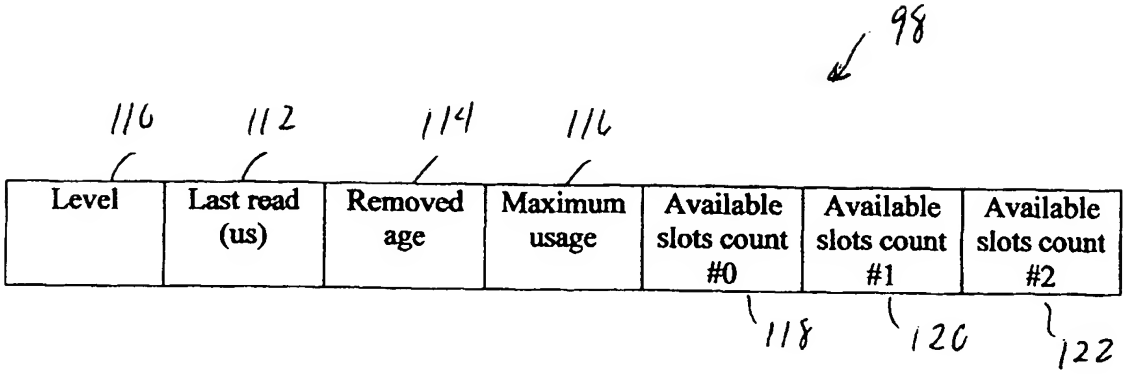

FIG. 5A

100

130

Level	Last read (µs)	Removed age	Maximum usage	Available slots count #0	Available slots count #1	Available slots count #2
0	1000 ago	> ftt - 50	3 slots	110	160	190
1	1000 ago	> ftt - 100	3 slots	90	140	170
2	1000 ago	> ftt - 150	3 slots	70	120	150
3	2000 ago	> ftt - 150	8 slots	unlimited	unlimited	unlimited

FIG. 5B

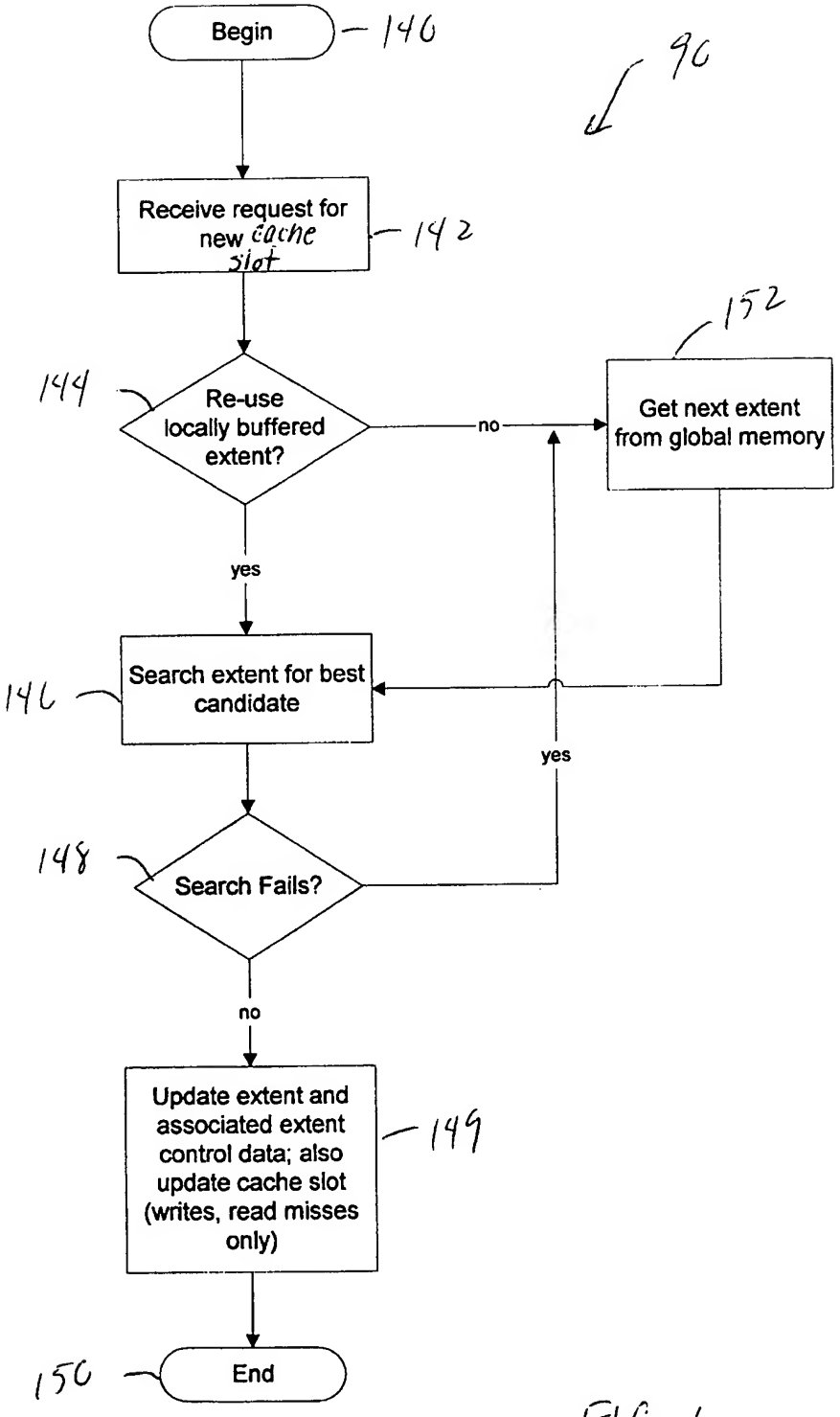
Begin
140
90
Receive request for new cache slot
142
152
144
Re-use locally buffered extent?
no
Get next extent from global memory
yes
Search extent for best candidate
146
yes
148
Search Fails?
no
Update extent and associated extent control data; also update cache slot (writes, read misses only)
149
150
End

FIG. 6

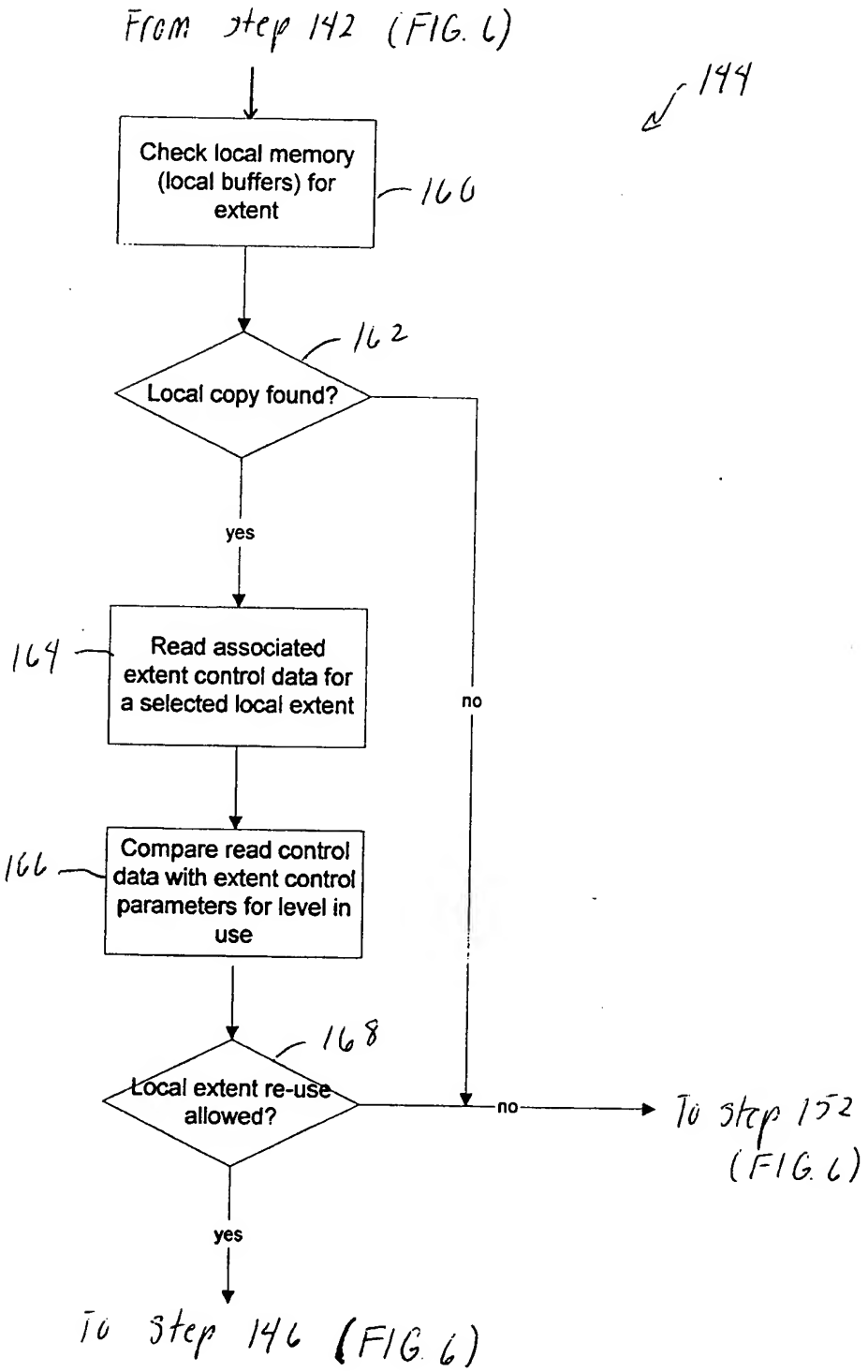
From step 142 (FIG. 6)
144
Check local memory (local buffers) for extent
160
162
Local copy found?
yes
no
164
Read associated extent control data for a selected local extent
166
Compare read control data with extent control parameters for level in use
168
Local extent re-use allowed?
no
To step 152 (FIG. 6)
yes
To step 146 (FIG. 6)

FIG. 7

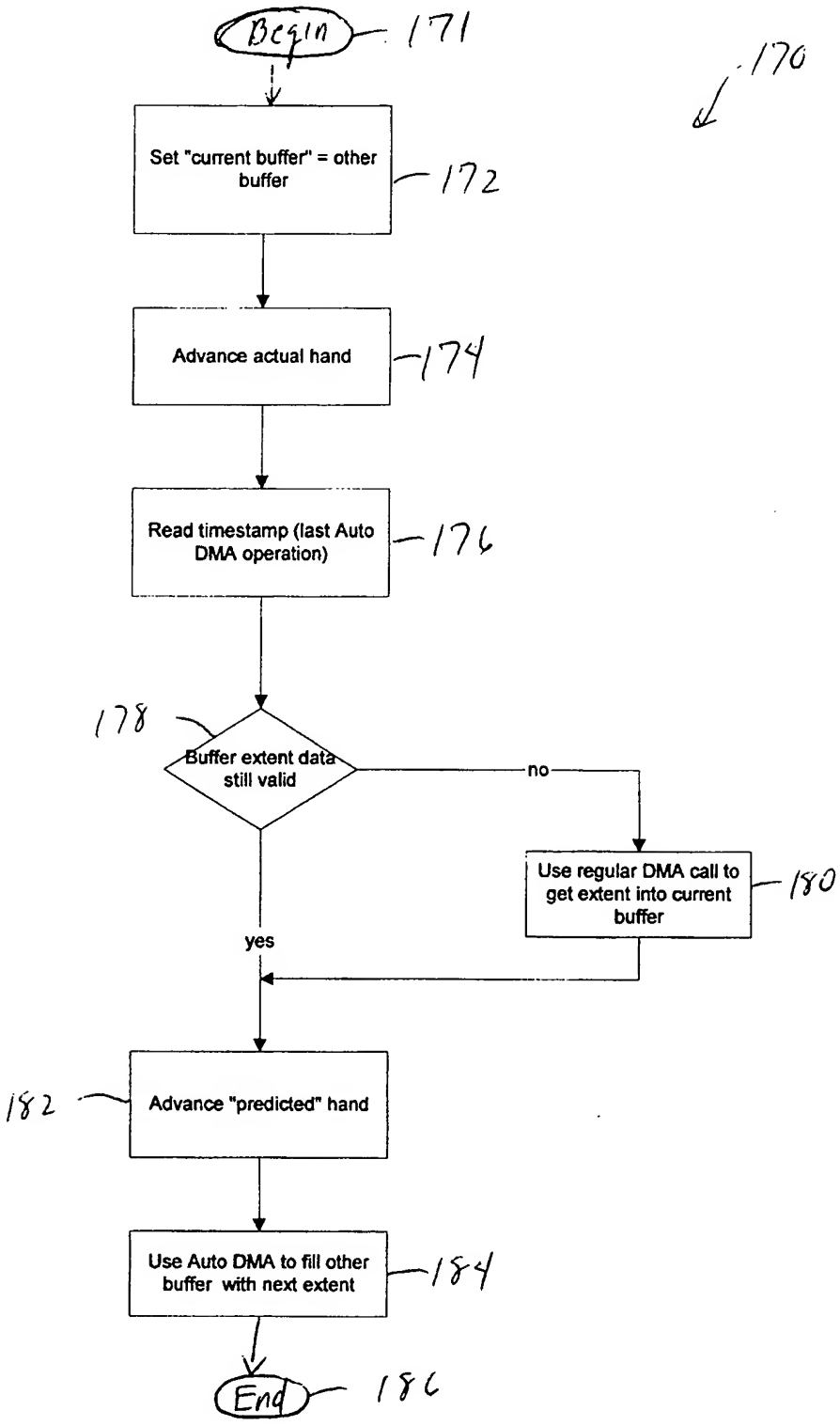
Begin
171
170
Set "current buffer" = other buffer
172
Advance actual hand
174
Read timestamp (last Auto DMA operation)
176
178
Buffer extent data still valid
no
Use regular DMA call to get extent into current buffer
180
yes
182
Advance "predicted" hand
Use Auto DMA to fill other buffer with next extent
184
End
186

FIG. 8